Ebola Virus Disease

IMMEDIATELY REPORTABLE DISEASE

Per N.J.A.C. 8:57, healthcare providers and administrators shall immediately report **by telephone** confirmed and suspected cases of viral hemorrhagic fever to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. The health officer (or designee) **must immediately institute the control measures listed below in section 5, "Controlling Further Spread**," regardless of weekend, holiday, or evening schedules. A directory of local health departments in New Jersey is available at http://localhealth.nj.gov.

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609-826-5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609-392-2020 during all other days and hours.

1 THE DISEASE AND ITS EPIDEMIOLOGY

Etiologic Agent

Ebola virus disease (EVD), also known as Ebola hemorrhagic fever or simply Ebola, is a severe, often fatal disease that can occur in humans and some animals. EVD is a type of viral hemorrhagic fever (VHF). VHFs are severe multisystem syndromes, meaning multiple organ systems in the body can be affected in infected individuals. Ebola virus, a type of filovirus, was first identified in 1976. Filoviruses belong to the *Filoviridae* virus family and can cause severe hemorrhagic fever in humans. To date, five members, or genera, of this virus family, have been identified: *Cuevavirus*, *Ebolavirus*, *Marburgvirus*, *Striavirus*, and *Thamnovirus*. Six species within the Ebolavirus genus have been identified: Ebola virus (species *Zaire ebolavirus*), Sudan virus (species *Sudan ebolavirus*), Taï Forest virus (species *Taï Forest ebolavirus*, formerly *Côte d'Ivoire ebolavirus*), Bundibugyo virus (species *Bundibugyo ebolavirus*), Reston virus (species *Reston ebolavirus*), and Bombali virus (species *Bombali ebolavirus*). Ebola, Sudan, Taï Forest, and Bundibugyo viruses can cause human disease, while Ebola-Reston does not. Bombali virus was recently discovered in bats in 2018 and it is currently unknown if it also causes disease in humans.[1]

Clinical Description

VHFs damage the overall vascular system, impairing the body's ability to regulate itself. Symptoms are often accompanied by hemorrhage (bleeding); however, the bleeding is rarely life-threatening. While some types of hemorrhagic fever viruses can cause relatively mild illnesses, many of these viruses cause severe, life-threatening disease.

EVD can be confused with other more common infectious diseases such as malaria, typhoid fever, meningococcemia, and other bacterial infections. EVD presents as an acute illness with a sudden onset of fever, malaise, myalgia, arthralgia, and headache typically 8 to 12 days after exposure. After about day five of illness, most patients develop gastrointestinal symptoms, including nausea, vomiting, diarrhea, and abdominal pain. Other signs and symptoms include pharyngitis, maculopapular rash, conjunctivitis, hiccups, chest pain, shortness of breath, confusion, cerebral edema, and seizures. Non-fatal cases typically improve 6-11 days after symptom onset. Bleeding may manifest as petechiae (tiny colored dots below the skin), ecchymosis (bleeding under the skin), bruising, oozing from venipuncture sites, mucosal hemorrhage, and frank hemorrhage. Laboratory findings usually show leukopenia, lymphopenia, severe thrombocytopenia, elevated liver enzymes, proteinuria, prolonged prothrombin and partial thromboplastic times, and elevated fibrin degradation. Patients with fatal disease

[1] Forbes KM, Webala PW, Jääskeläinen AJ, et al. Bombali Virus in Mops condylurus Bat, Kenya. Emerging Infectious Diseases. 2019;25(5):955-957. doi:10.3201/eid2505.181666.

usually develop more severe clinical signs early during infection and die typically between days 6 and 16 of complications including multiorgan failure and septic shock. The case fatality rate for Ebola infections is approximately 70%.

Reservoirs

The reservoirs for Ebola viruses are likely fruit bats or non-human primates (chimpanzees, apes, monkeys, etc.). EVD is a type of zoonotic disease, given that humans are likely initially infected with Ebola virus via contact with an infected animal. After this initial infection, the virus can spread from person to person.

Mode of Transmission

Scientists think that Ebola patients become infected through contact with an infected animal, such as a fruit bat or primate (apes and monkeys). Person-to-person transmission follows through direct contact. The contact may be through broken skin or mucous membranes such as the eyes, nose, or mouth with blood or body fluids (including urine, saliva, sweat, feces, vomit, breast milk, and semen) of a person who is sick with or has died from Ebola. The contact may be through objects (like clothing, bedding, medical equipment, needles, and syringes) that have been contaminated with body fluids from a person who is sick with Ebola or the body of a person who has died from Ebola. Or the contact may be from sex or contact with semen from a man who has recovered from Ebola (for example, by having oral, vaginal, or anal sex). To date, there is no evidence that Ebola can be spread through sex or other contact with vaginal fluids from a woman who has had Ebola. The risk of Ebola transmission from direct skin contact with an Ebola patient is lower than the risk from exposure to blood or body fluids but may be more likely in severe illness (when the Ebola virus ribonucleic acid (RNA) levels are highest). It is not known if transmission from direct skin contact is mediated by Ebola virus primarily on the skin or by micro-contamination of the skin with blood or other body fluids.

Airborne transmission of Ebola virus among humans has never been demonstrated in investigations that have described human-to-human transmission, although hypothetical concerns about aerosol transmission of Ebola have been raised. Ebola is not spread through water, or in general, by food. However, Ebola may be spread as a result of handling bushmeat (wild animals hunted for food) and contact with infected bats. There is no evidence that mosquitoes or other insects can transmit Ebola.

All bodily fluids and clinical specimens from Ebola patients should be considered as potentially infectious. Healthcare providers caring for Ebola patients and family and friends in close contact with Ebola patients are at the highest risk of getting sick because they may come in contact with infected blood or body fluids. Dedicated medical equipment (preferably disposable, when possible) should be used by healthcare personnel providing patient care. Proper cleaning and disposal of instruments, such as needles and syringes, also are important. If instruments are not disposable, they must be sterilized before being used again.

Incubation Period

The incubation period for EVD range from 2 to 21 days, with an average of 8 to 10 days after contact with the virus.

Signs and Symptoms

The course of EVD illness typically progresses from "dry" symptoms initially (such as fever, aches and pains, and fatigue), and then progresses to "wet" symptoms (such as diarrhea and vomiting) as the person becomes sicker.

Primary signs and symptoms of Ebola often include some or several of the following:

- Fever
- Aches and pains, such as severe headache, muscle and joint pain, and abdominal (stomach) pain
- Weakness and fatigue
- Gastrointestinal symptoms including diarrhea and vomiting
- Abdominal (stomach) pain
- Unexplained hemorrhaging, bleeding or bruising
- Other signs may include red eyes, skin rash, and hiccups (late stage)

Period of Communicability or Infectious Period

Ebola is not transmitted prior to febrile illness. The virus is usually detectable in the infected patient's blood at the time of fever and symptom onset, although Ebola virus RNA levels at the time of fever and symptom onset are typically low (near the detection threshold limits) and in some patients may not be reliably detectable during the first three days of illness. Ebola virus RNA levels in blood have been shown to increase during the acute phase of illness. The bodies of deceased Ebola virus-infected people are highly infectious. Among patients who survive, Ebola virus RNA levels in the blood decrease during clinical recovery. The persistence of Ebola virus RNA in the blood and other body fluids of convalescent Ebola patients varies by fluid type, but data are limited.

Ebola RNA in blood is detectable by real-time polymerase chain reaction (RT-PCR) for up to 2-3 weeks after symptom onset.[2] However, the detection of viral Ebola RNA does not necessarily indicate that infectious virus is present. Due to the limited amount of longitudinal data that exists, it is not known whether Ebola viral presence may be intermittent. Research is underway to determine the persistence of Ebola virus among EVD survivors. Studies and published case reports have shown that Ebola virus RNA was detected within these time periods after illness onset for the following bodily fluids: up to 22 days in saliva, 28 days from tears/conjunctival swabs, 29 days from rectal swabs/stool, 33 days from vaginal fluid, 38 days in amniotic fluid, 44 days in sweat, 64

[2] Malvy D., McElroy A. K., de Clerck H., Gunther S., van Griensven J. (2019). Ebola virus disease. Lancet 393 936–948. 10.1016/s0140-6736(18)33132-5

days in urine, 101 days in aqueous humor, nine months in cerebrospinal fluid, 16 months in breast milk and over two years in semen.[3,4]

Epidemiology

Ebola viruses are endemic to several West African and Equatorial African countries. Ebola was first discovered in 1976 near the Ebola River in what is now the Democratic Republic of the Congo (DRC). Since then, outbreaks of Ebola among humans have appeared sporadically throughout the globe. The 2014-2016 Ebola epidemic was the largest in history and was declared a Public Health Emergency of International Concern (PHEIC) by the World Health Organization (WHO). A total of over 28,000 EVD cases and over 11,000 associated deaths were reported in West Africa (Guinea, Liberia, and Sierra Leone); 36 additional cases and 15 deaths occurred elsewhere. Overall, eleven people were treated for Ebola in the United States during the 2014-2016 epidemic; two of these people died. There have been no Ebola cases in New Jersey (NJ), although many travelers were monitored for symptoms during the 2014-16 West Africa Ebola outbreak.

Since the 2014-2016 West Africa Ebola outbreak, there have been several Ebola outbreaks in the DRC. From August 2018 to June 2020, there was an Ebola outbreak in Eastern DRC. This 2018 Eastern DRC outbreak was the 10th outbreak of Ebola in DRC and affected the North Kivu, South Kivu, and Ituri provinces. Also, four Ebola cases were imported from Eastern DRC to Uganda. The WHO declared the 2018 Eastern DRC outbreak to be a PHEIC on July 17, 2019 and the event stands as the second largest Ebola outbreak since the discovery of the pathogen in 1976. The 2018 Eastern DRC Ebola outbreak was associated with 3470 cases, 2287 deaths and 1171 survivors. From June 2020 to November 2020, there was an Ebola outbreak in the Equateur province of the DRC, the 11th Ebola outbreak in the country. The 2020 Equateur DRC Ebola outbreak was associated with 119 confirmed cases, 11 probable cases, 55 deaths and 75 survivors.

Bioterrorist Potential

VHFs, including Ebola, are considered to be potential Category A bioterrorism agents by the Centers for Disease Control and Prevention (CDC). This category level includes priority agents that pose a risk to national security. If acquired and properly disseminated, VHFs could cause a serious public health challenge in terms of the ability to limit the numbers of casualties and control other repercussions from such an attack.

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[3] Vetter P, Fischer WA, 2nd, Schibler M, Jacobs M, Bausch DG, Kaiser L. Ebola virus shedding and transmission: review of current evidence. J Infect Dis. 2016;214(Suppl 3): S177–S184.

[4] Fischer WA, Brown J, Wohl DA, Loftis AJ, Tozay S, Reeves E, et al. Ebola virus ribonucleic acid detection in semen more than two years after resolution of acute Ebola virus infection. Open Forum Infect Dis. 2017;4: ofx155.

Vaccine

In 2019, an EVD vaccine, the recombinant vesicular stomatitis virus–Zaire Ebola virus (rVSV-ZEBOV) (tradename "Ervebo") was approved by the U.S. Food and Drug Administration (FDA) for use in the United States to prevent *Zaire ebolavirus*. Testing is underway for other investigational vaccines to prevent EVD.

Treatment

Clinical management of EVD should focus on supportive care of complications, such as hypovolemia, electrolyte abnormalities, hematologic abnormalities, refractory shock, hypoxia, hemorrhage, septic shock, multiorgan failure, and disseminated intravascular coagulation (DIC).

2 CASE DEFINITION

The NJDOH Infectious & Zoonotic Disease Program follows the most current VHF case definition as published on the CDC National Notifiable Disease Surveillance System website.

Viral Hemorrhagic Fever Definition*: https://wwwn.cdc.gov/nndss/conditions/viral-hemorrhagic-fever/case-definition/2011/

Case definitions enable public health to classify and count cases consistently across reporting jurisdictions and should not be used by healthcare providers to determine how to meet an individual patient's health needs.

*The VHF case definition refers to viral hemorrhagic fever caused by either **Ebola**, Lassa, Lujo, or Marburg virus, a New World arenavirus, or Crimean-Congo hemorrhagic fever.

Clinical Criteria:

An illness with acute onset with **ALL** of the following clinical findings:

- A fever >104°F (40°C), AND
- One or more of the following clinical findings:
  - Severe headache
  - Muscle pain
  - Erythematous maculopapular rash on the trunk with fine desquamation 3–4 days after rash onset
  - Vomiting
  - Diarrhea
  - Pharyngitis (arenavirus only)
  - Abdominal pain
  - Bleeding not related to injury
  - Retrosternal chest pain (arenavirus only)

- Proteinuria (arenavirus only)
- Thrombocytopenia

Laboratory Criteria for Diagnosis:

One or more of the following laboratory findings:

- Detection of viral hemorrhagic fever (VHF) viral antigens in blood by enzyme-linked Immunosorbent Assay (ELISA) antigen detection
- VHF viral isolation in cell culture for blood or tissues
- Detection of VHF-specific genetic sequence by Reverse Transcription-Polymerase Chain Reaction (RT-PCR) from blood or tissues
- Detection of VHF viral antigens in tissues by immunohistochemistry

Epidemiological Linkage:

One or more of the following exposures within the 3 weeks before onset of symptoms:

- Contact with blood or other body fluids of a patient with VHF
- Residence in—or travel to—a VHF endemic area
- Work in a laboratory that handles VHF specimens
- Work in a laboratory that handles bats, rodents, or primates from endemic areas
- Exposure to semen from a confirmed acute or convalescent case of VHF within the 10 weeks of that person's onset of symptoms

Case Classification

CONFIRMED: Case meets the clinical and laboratory criteria.

POSSIBLE: Case meets the clinical and epidemiologic linkage criteria.

3 LABORATORY TESTING

General Ebola Diagnostic Testing

Diagnosing Ebola in a person who has been infected for only a few days is difficult because the early symptoms, such as fever, are nonspecific to Ebola infection and often are seen in patients with more common diseases, such as malaria and typhoid fever. Ebola virus is detected in blood only after onset of symptoms, most notably fever, which accompany the rise in circulating virus within the patient's body. It may take up to three days after symptoms start for the virus to reach detectable levels.

RT-PCR is the standard diagnostic method because of its ability to detect low levels of Ebola virus RNA. Within a few days after symptoms begin, Ebola virus disease can be diagnosed by antigen-capture enzyme-linked immunosorbent assay (ELISA) testing, immunoglobulin M (IgM) ELISA, RT-PCR, or virus isolation. Later in the course of disease or during recovery, serologic testing of IgM and immunoglobulin G (IgG) antibodies may

be performed because people who recover from Ebola infection develop antibodies that can last for at least ten years. Immunohistochemistry, RT-PCR, and viral isolation can be performed on post-mortem tissue specimens.

RT-PCR testing for Ebola virus:

A negative RT-PCR test result for Ebola virus from a blood specimen collected less than 72 hours after symptom onset does not necessarily rule out an Ebola virus infection. If the patient is still symptomatic after 72 hours, repeat testing is recommended. A negative RT-PCR test result for Ebola virus from a blood specimen collected more than 72 hours after symptom onset rules out Ebola virus infection. Positive Ebola virus RT-PCR results are considered presumptive until confirmed by CDC. Repeat testing may be needed for patients with symptoms for fewer than three days.

Ebola Testing in NJ

Local health officials, New Jersey Department of Health/Communicable Disease Service (NJDOH/CDS) and the CDC will determine the need for testing and where the specimens should be sent. The New Jersey Public Health Laboratory (PHEL) has the capacity to perform the Ebola Virus NP Real-Time RT-PCR Assay; Ebola Virus VP40 Real-Time RT-PCR Assay and will be the site for initial testing of the blood specimen. **Testing is only recommended for persons who meet criteria for Persons Under Investigation (PUI) for EVD.** If it is determined that testing for Ebola virus is indicated, two full, 3 or 4 mL lavender top ethylenediaminetetraacetic acid (EDTA) tubes of blood are required. Any need for follow-up testing will be determined in consultation with the NJDOH/CDS and the CDC.

Diagnostic immunoassays and molecular tests for Ebola virus infection are commercially available. While a decision to pursue such capability ultimately lies with individual laboratories, these tests should not be used as a replacement for testing performed at NJ PHEL and the CDC.

Laboratory Resources:

- New Jersey Ebola Testing Algorithm, NJDOH Recommendation Regarding FDA EUA Tests and Clinical Laboratory Testing: https://www.nj.gov/health/cd/documents/topics/vhf/NJDOH%20PHEL%20Ebola%20Guidance%201-23-20%20final.pdf

- CDC Guidance for Collection, Transport and Submission of Specimens for Ebola Virus Testing: https://www.cdc.gov/vhf/ebola/laboratory-personnel/index.html

4 PURPOSE OF SURVEILLANCE AND REPORTING

- To promptly identify imported cases an prevent further transmission within the United States
- To identify sources of transmission and geographical areas of risk outside of the United States
- To identify cases and clusters of human illness that may be associated with a bioterrorist event
- To provide clinicians, travelers, and residents with appropriate preventive health information

5 CASE INVESTIGATION

Clinical Evaluation

As a matter of routine practice, healthcare facilities should obtain a travel history in triage before completing full patient evaluation so that infection control precautions and patient placement can begin promptly when appropriate.

Epidemiologic Risk Factors

A person who has both consistent signs or symptoms and risk factors as follows should be considered a Person Under Investigation (PUI):

1. Elevated body temperature or subjective fever or symptoms, including severe headache, fatigue, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage; **AND**

2. An epidemiologic risk factor within 21 days before the onset of symptoms.

Exposure Risks

If a patient has signs, symptoms and/or diagnostic findings concerning for EVD, clinicians should ask about possible exposures in the 21 days prior to symptom onset.

<u>The exposure risks may include:</u>

- Travel to an area with active EVD/VHF transmission
- Close contact with sick person(s) who recently traveled to a region experiencing an EVD/VHF outbreak
- Contact with blood or body fluids (urine, saliva, sweat, feces, vomit, breast milk, semen) of someone ill with EVD, or who died of EVD
- Participation in funeral rituals, including preparation of bodies for burial or touching a corpse at a traditional burial ceremony

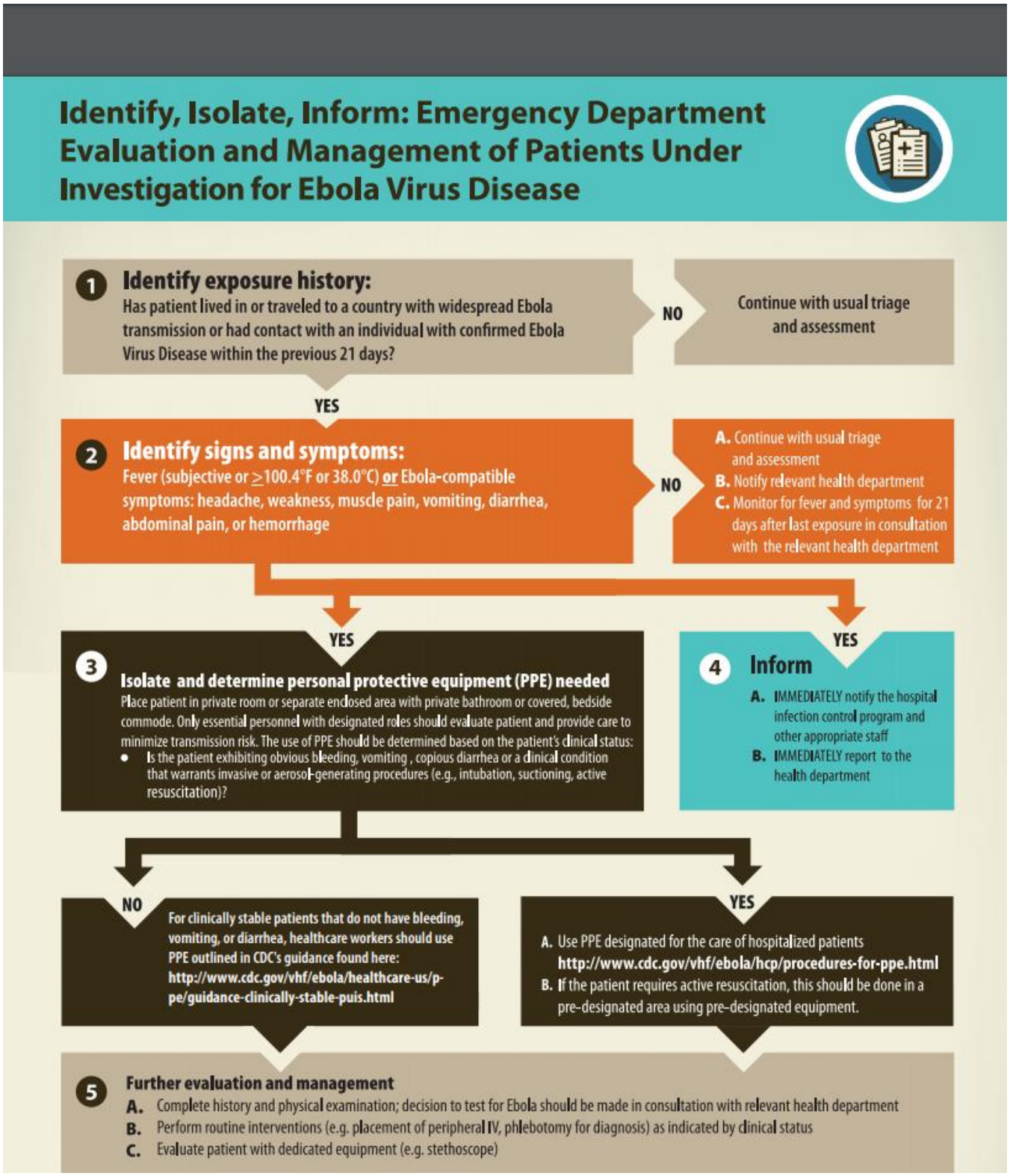
- Working in a laboratory where Ebola/VHF human specimens are handled
- Handling wild animals or carcasses that may be infected with EVD (e.g., non-human primates, fruit bats)
- Contact with semen from a man who has recovered from EVD (e.g., through oral, vaginal, or anal sex)
- Objects (such as clothes, bedding, needles, and medical equipment) contaminated with body fluids from a person who is sick with or has died from EVD

Vaccination

- Healthcare providers should inquire if the patient was vaccinated against Ebola and record the date of vaccination, if known

If there is a clinical suspicion of Ebola, a PUI determination and medical evaluation should be made as quickly as possible in order to ensure patient care is not compromised.

Evaluation and Management of PUIs for EVD:



Inform Public Health Authorities

Clinicians should contact their facility infection preventionist and the Local Health Department (LHD) immediately if EVD is suspected. A directory of LHDs is available at http://localhealth.nj.gov. If the LHD cannot be reached, clinicians should call NJDOH/CDS at 609- 826-5964 during business hours and 609-392-2020 after business hours.

Clinical and Epidemiological Ebola Assessment Resources:

- CDC Cases and Outbreaks of EVD by Year and By Country: https://www.cdc.gov/vhf/ebola/history/chronology.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvhf%2Febola%2Foutbreaks%2Fhistory%2Fchronology.html

- CDC's Travelers' Health website: https://wwwnc.cdc.gov/travel/destinations/list

- CDC Ebola Virus Disease (EVD) Information for Clinicians in U.S. Healthcare Settings: https://www.cdc.gov/vhf/ebola/healthcare-us/preparing/clinicians.html

- CDC Identify, Isolate, Inform: Emergency Department Evaluation and Management for Patients Under Investigation (PUIs) for Ebola Virus Disease (EVD): https://www.cdc.gov/vhf/ebola/clinicians/emergency-services/emergency-departments.html

- CDC For Clinicians, Evaluating Patients: https://www.cdc.gov/vhf/ebola/clinicians/index.html

- CDC Person Under Investigation (PUI): https://www.cdc.gov/vhf/ebola/clinicians/evaluating-patients/case-definition.html

Infection Control

CDC recommends a combination of measures to prevent transmission of EVD in hospitals including personal protective equipment (PPE). Healthcare personnel might need to take additional infection control steps if a PUI or patient with confirmed EVD has other conditions or illnesses caused by specific infectious diseases, such as tuberculosis.

Healthcare personnel can be exposed to Ebola virus by touching a patient's body fluids, contaminated medical supplies and equipment, or contaminated environmental surfaces. Splashes to unprotected mucous membranes (for example, the eyes, nose, or mouth) are particularly hazardous. Procedures that can increase environmental contamination with infectious material or create aerosols should be minimized.

Isolation

Clinicians should immediately isolate any patient with relevant exposure history and signs or symptoms compatible with EVD or other VHF in a single patient room

(containing a private bathroom) with the door closed. Healthcare personnel should follow standard, contact, and droplet precautions. In consultation with NJDOH/CDS, suspected or confirmed patients may be transported to a state or regional Ebola Assessment or Treatment hospital. Because blood and secretions can shed virus for up to several months, patient education should be provided prior to discharge.

Personal Protective Equipment

Healthcare personnel should follow latest CDC guidance for PPE depending on patient condition.

Environmental Cleaning and Disinfection

Ebola viruses are transmitted through direct contact with infected blood or body fluids/substances (urine, feces, vomit) or through exposure to objects (such as needles) that have been contaminated with infected blood or body fluids. The role of the environment in transmission has not been established. Limited laboratory studies under favorable conditions indicate that Ebola virus can remain viable on solid surfaces, with concentrations falling slowly over several days. There is no epidemiologic evidence of Ebola virus transmission via either the environment or fomites that could become contaminated during patient care (bed rails, doorknobs, laundry). However, given the apparent low infectious dose, potential of high virus titers in the blood of ill patients, and disease severity, higher levels of precaution are warranted to reduce the potential risk posed by contaminated surfaces in the patient care environment.

Hospitals

As part of the care of PUIs or patients with confirmed EVD, hospitals are recommended to:

- Be sure environmental services staff wear recommended PPE to protect against direct skin and mucous membrane exposure of cleaning chemicals, contamination, and splashes or spatters during environmental cleaning and disinfection activities.
- Use a U.S. Environmental Protection Agency (EPA)-registered hospital disinfectant with a label claim for a non-enveloped virus (norovirus, rotavirus, adenovirus, poliovirus) to disinfect environmental surfaces in rooms of PUIs or patients with confirmed EVD.
- Avoid contamination of reusable porous surfaces that cannot be made single use.
- Routinely clean and disinfect the PPE doffing area.
- Discard all linens, nonfluid-impermeable pillows or mattresses, and textile privacy curtains into the waste stream and disposed of appropriately.

Infection Control Resources

- CDC's Infection Prevention and Control Recommendations for Hospitalized Patients Under Investigation (PUIs) for Ebola Virus Disease (EVD) in U.S. Hospitals: https://www.cdc.gov/vhf/ebola/clinicians/evd/infection-control.html

- Donning and Doffing Personal Protective Equipment (PPE) for Evaluating Persons Under Investigation (PUIs) for Ebola Who Are Clinically Stable and Do Not Have Bleeding, Vomiting, or Diarrhea: https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance-clinically-stable-puis.html

- Guidance on Personal Protective Equipment (PPE) To Be Used By Healthcare Workers during Management of Patients with Confirmed Ebola or Persons under Investigation (PUIs) for Ebola who are Clinically Unstable or Have Bleeding, Vomiting, or Diarrhea in U.S. Hospitals, Including Procedures for Donning and Doffing PPE: https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance.html

- Cleaning and Disinfecting Healthcare Environments: https://www.cdc.gov/vhf/ebola/healthcare-us/cleaning/index.html

Asymptomatic PUIs and Quarantine

PUIs who are asymptomatic should be monitored for 21 days after last exposure for the development of fever and/or other symptoms and evaluated medically if symptoms develop.

Persons at high risk of exposure to Ebola who are asymptomatic may be placed under voluntary or required quarantine for the duration of their monitoring period. The decision whether to quarantine contacts will be made on a case-by-case basis in consultation with NJDOH/CDS.

Investigation Guidelines

After notifying public health authorities by telephone, initial clinical and exposure information should be documented. To assist with the investigation of suspect Ebola cases, the NJDOH Ebola Investigation Worksheet can be used to collect initial essential information via telephone from the healthcare provider. The NJDOH Ebola Investigation Worksheet can be found on the NJDOH Ebola/Viral Hemorrhagic Fevers website: https://www.nj.gov/health/cd/topics/vhf.shtml.

Submit the completed NJDOH Ebola Investigation Worksheet with all test results via encrypted email to NJDOH/CDS CDSVectorTeam@doh.nj.gov or fax to 609-826-4874. If the report meets criteria for a PUI, a case should be created in the New Jersey Communicable Disease Reporting and Surveillance System (CDRSS).

Key CDRSS Fields Specific for Ebola

CDRSS Screen	Required Information
Disease Information	• Select "Ebola"
Patient Personal Information	• Indicate if the patient lives with any pets, specifying the number and type of animal(s)
Case Comments	• Indicate the patient's occupation and industry/work setting
Laboratory and Diagnostic Test Information	• Enter diagnostic test results (other than results listed in the travel risk assessment section) in the comments section
Additional Requirements: Person Under Investigation	• Enter information about the patient's medical care prior to the current hospitalization/healthcare visit • For EVD Positive patients: List places visited and dates/times visited • Enter the following diagnostic test results: influenza, malaria, blood culture, complete blood count (CBC), blood chemistry, and urinalysis
Additional Requirements: Traveler Monitoring	• Enter traveler monitoring details daily
Additional Requirements: Travel Risk Assessment	• Indicate if the traveler could be interviewed in English or if the patient speaks another language • Enter if the traveler has symptoms of Ebola. Enter symptoms in this section – not Signs/Symptoms section. Only enter information in the Signs/Symptoms section if the patient becomes a PUI. • Select the overall risk level of the traveler (high risk/some risk/low risk) • Enter the traveler's trip details • Enter risk factor responses related to travelers
Contact Tracing	• Enter names of household and other contacts
Immunization Information	• Enter if the patient was vaccinated against Ebola; enter the date of the vaccination, if known

CDRSS Screen	Required Information
Risk Factors	• Enter risk factor responses related to the PUI • Describe other potential exposures and what (if any) PPE was used in the comments
Signs/Symptoms	• Select the signs/symptoms reported/displayed by the PUI

6 CONTROLLING FURTHER SPREAD

Contract Tracing of Persons Exposed to Ebola Virus

Contact tracing is the process of identifying, assessing, and monitoring persons who have been exposed to a communicable disease to prevent further transmission.

Identification of Contacts of a Confirmed EVD Case

If an EVD case is identified in New Jersey, the NJDOH/CDS will work with the LHD and relevant healthcare facilities to identify persons exposed to the case patient and to assess level of risk. NJDOH/CDS will provide a risk assessment questionnaire to identify and interview potential exposures in both community and healthcare settings.

Assessing Exposure Risk of Contacts of a Confirmed EVD Case

Ebola contacts will be categorized into four risk exposure categories: high risk, low risk, very low but not zero risk, and no known exposure. Examples of exposures are defined below.

- **High risk exposure:**
  - Percutaneous exposure to potentially infectious material: vomitus, excreta, blood or body fluids (e.g., needle-stick injuries, exposure through broken skin)
  - Direct, unprotected contact with potentially infectious material (e.g., touching vomitus with an ungloved hand)

- Mucosal exposure to splashes or droplets of potentially infectious material (e.g., to eyes, nose, mouth), mouth-to-mouth kissing, or sexual contact with a symptomatic patient

- **Low risk exposure:**
  - Sharing a room or vehicle within 3 feet of a potentially infectious patient, without direct contact with potentially infectious material
  - Providing routine medical care while using personal protective equipment appropriately
  - Routine cleaning and laundry of contaminated linens and surfaces while using personal protective equipment appropriately
  - Transport of a potentially infectious patient without direct contact with potentially infectious material
  - Handling of clinical specimens while using personal protective equipment appropriately
  - Casual skin to skin contact without contact with blood or other body fluids
- **Very low but not zero risk exposure:**
  - No known exposure is identified, but potential/very low risk may exist (e.g., presence in facility with confirmed EVD case)
- **No known exposure:**
  - No contact with an EVD case and/or no presence in an area with an EVD case while infectious

Monitoring Contacts of a Confirmed EVD Case

Community contacts will be entered into the NJDOH CDRSS with symptom reports entered daily by the LHD. Healthcare facility contacts will either be entered into CDRSS or maintained on a facility-specific spreadsheet. If a facility-specific spreadsheet is used, it will be sent to public health authorities daily via encrypted email or a password-protected file. NJDOH/CDS will work with LHDs to monitor community contacts and with healthcare facilities to monitor healthcare worker contacts. All contacts will be monitored for fever and EVD-compatible symptoms for 21 days from their last exposure to an Ebola case, including on holidays and weekends.

Contact Risk Level	**Type of Monitoring**	**Public Health Reporting**

High Risk	Direct active monitoring: AM and PM temperature and symptom monitoring, with one reading directly observed by LHD or healthcare facility personnel	Once daily, at time of direct observation, or if/when symptoms develop
Low Risk	Active monitoring: AM and PM temperature and symptom monitoring	Once daily, or if/when symptoms develop
Very low, but not Zero Risk	Self-monitor for fever and other EVD symptoms for 21 days	Only if/when symptoms develop
No Known Exposure	N/A	N/A

NJDOH/CDS will coordinate with the CDC's Division of Global Migration and Quarantine (DGMQ) and LHDs to implement international and domestic travel restrictions, as needed and based on risk exposure categories.

Monitoring Travelers from Areas with Active Ebola Transmission

Periodic outbreaks of Ebola have occurred in several African countries since it was initially discovered in 1976. The CDC has information for travelers and guidance for preventing infection and advises that travelers pay attention to their health during travel and for 21 days after leaving an outbreak area. If EVD-compatible symptoms develop, CDC advises travelers to call ahead before seeking medical care, so arrangements can be made to protect the traveler and others in the healthcare facility. In most scenarios, travelers to areas with active Ebola transmission will not be monitored by public health authorities unless DGMQ activates enhanced entry screening at US airports.

Guidance for Sponsoring Organizations

CDC provides guidance to organizations who sponsor healthcare workers that travel to areas with active Ebola transmission to include exit screening and monitoring once travelers leave the outbreak area[5]. NJDOH/CDS will work with sponsoring organizations to monitor healthcare workers returning to New Jersey for 21 days.

[5] Ebola Recommendations for Organizations: https://wwwnc.cdc.gov/travel/page/recs-organizations-sending-workers-ebola

Activation of Enhanced Entry Screening

If the risk of international spread of Ebola is elevated, DGMQ may institute enhanced entry screening of incoming flights to US airports. NJDOH/CDS will work with DGMQ to identify and monitor travelers from an area with active Ebola transmission as described below.

1. NJDOH/CDS will receive DGMQ Ebola airport screening notifications distributed through CDC's Epidemic Information Exchange (Epi-X).

2. For any persons living and/or staying in New Jersey, NJDOH/CDS will enter the traveler (or resident) into CDRSS, noting the New Jersey address where the person will be staying.

3. The LHD should contact the traveler to evaluate risk, assess their health status, give instructions for active monitoring and provide a phone number where the LHD can be reached 24/7. LHDs should monitor travelers for fever and EVD symptoms for 21 days from their departure date from an area with active Ebola transmission, including on holidays and weekends, according to risk exposure level:

Traveler Exposure Risk Level	Type of Monitoring	Public Health Reporting
High-Risk	Direct active monitoring: AM and PM temperature and symptom monitoring, with one reading directly observed by LHD or healthcare facility personnel	Once daily, at time of direct observation, or if/when symptoms develop
Low-Risk	Active monitoring: AM and PM temperature and symptom monitoring	Once daily, or if/when symptoms develop
Very low, but not Zero Risk	Self-monitor for fever and other EVD symptoms for 21 days	Only if/when symptoms develop
No Known Exposure	N/A	N/A

All travelers identified through enhanced entry screening should be advised to notify the LHD if fever and/or EVD-compatible symptoms develop. Travelers should not wait until their scheduled report time to notify the LHD of symptoms. The LHD will contact NJDOH/CDS regarding the reported symptoms, and NJDOH/CDS will review the traveler's medical status. If indicated, NJDOH/CDS will work with other NJDOH Divisions to discuss and/or coordinate notification and transport to an appropriate healthcare facility.

Managing Special Situations

Outbreak Response

Sporadic cases of VHF, including Ebola, are not uncommon in certain countries. If one or more counties experience widespread transmission, additional recommendations may

be implemented, including traveler and patient screening, diagnostic testing, and monitoring.

Bioterrorism

If a bioterrorism event is suspected, NJDOH and other response authorities will work closely with local officials to provide additional guidance and instructions.

Pregnancy

Ebola can cross the placenta, and a pregnant woman infected with the virus will likely transmit it to the fetus. Pregnant women with Ebola infections are at a higher risk for adverse pregnancy outcomes, including fetal, neonatal and maternal mortality.

Breastfeeding

Women with confirmed or suspect EVD and women who recently recovered from EVD should not breastfeed, per the recommendations of the CDC and the WHO. Women who have recovered from EVD are recommended to breastfeed by the CDC and the WHO. A woman who has recovered from EVD, cleared viremia, and wants to continue breastfeeding should wait until she has had two consecutive negative RT-PCR breastmilk tests for Ebola virus, separated by 24 hours. During this time, the child should be given a breastmilk substitute.[6]

7 PREVENTION

Vaccine

On December 19, 2019, the rVSVΔG-ZEBOV-GP Ebola vaccine (Ervebo), a replication-competent, live attenuated vaccine was approved by the Food and Drug Administration (FDA) for the prevention of Ebola virus disease (EVD) caused by Ebola virus species Zaire ebolavirus (EBOV) in adults aged ≥18 years. On February 26, 2020, ACIP recommended preexposure vaccination with Ervebo for adults aged ≥18 years in the United States who are at highest risk for potential occupational exposure to EBOV because they are responding to an outbreak of EVD, work as health care personnel at federally designated Ebola treatment centers in the United States, or work as laboratorians or other staff at biosafety level 4 facilities in the United States

Specifically, the ACIP report recommends preexposure vaccination with Ervebo for adults aged ≥18 years in the U.S. population who are at highest risk for potential occupational exposure to EBOV because they are:

- responding to an outbreak of EVD,

[6] Guidelines for the management of pregnant and breastfeeding women in the context of Ebola virus disease. Geneva: World Health Organization; 2020. Licence: CC BY-NC-SA 3.0 IGO.

- working as health care personnel at federally designated Ebola treatment centers in the United States, or
- working as laboratorians or other staff at biosafety level 4 facilities in the United States.

Source:
https://www.cdc.gov/mmwr/volumes/70/rr/rr7001a1.htm?s_cid=rr7001a1_e&ACSTrackingID=USCDC_921-DM45878&ACSTrackingLabel=This%20Week%20in%20MMWR%20-%20Vol.%2070%2C%20January%208%2C%202021&deliveryName=USCDC_921-DM45878

International Travel

If you travel to or are in an area affected by an Ebola outbreak, make sure to do the following:

- Practice careful hygiene. Wash your hands with soap and water or an alcohol-based hand sanitizer and avoid contact with blood and body fluids (such as urine, feces, saliva, sweat, urine, vomit, breast milk, semen, and vaginal fluids) of persons who are ill.
- Do not handle items that may have come in contact with an infected person's blood or body fluids (such as clothes, bedding, needles, and medical equipment)
- Avoid funeral or burial rituals that require handling the body of someone who has died from Ebola
- Avoid contact with bats and nonhuman primates or blood, fluids, and raw meat prepared from these animals
- Avoid healthcare facilities where Ebola patients are being treated. The U.S. embassy or consulate is often able to provide advice on facilities.
- Avoid contact with semen from a man who has had Ebola until testing verifies that the Ebola virus is gone from his semen
- After you return, monitor your health for 21 days and seek medical care immediately if you develop symptoms of Ebola.

8 ADDITIONAL INFORMATION

- NJDOH/CDS: http://www.nj.gov/health/cd/topics/vhf.shtml#4
- CDC: https://www.cdc.gov/vhf/ebola/index.html

9 REFERENCES

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10 APPENDIX: EBOLA CLINICAL FACT SHEET FOR LOCAL AND STATE PUBLIC HEALTH AUTHORITIES

Ebola Clinical Fact Sheet for Local and State Public Health Authorities

Background/Purpose

Ebola virus disease (EVD) is a highly transmissible, pathogenic, and virulent pathogen New Jersey has never had a confirmed EVD case, but it is endemic to certain West African and Equatorial African countries. EVD has the potential to spread globally, as demonstrated by the large 2014-2015 West African outbreak. It is prudent for public health authorities to understand the epidemiologic, clinical and laboratory features of EVD so that they can remain vigilant in identifying possible cases when concerned clinicians notify them.

Person Under Investigation (PUI) Criteria

Currently, CDC defines a PUI as "A person who has both consistent signs and symptoms and risk factors as follows…

1. Elevated body temperature or subjective fever or symptoms, including severe headache, fatigue, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage; **AND**
2. An epidemiologic risk factor (see Epidemiology section) within the 21 days before the onset of symptoms."

Epidemiology

- Incubation Period for EVD ranges from 2 to 21 days. Those with EVD are not known to be infectious until symptoms develop.
- Modes of transmission include
    - Contact with natural reservoir or infected animal (most commonly nonhuman primate or fruit bats)
    - Direct contact with blood, secretions, and other body fluids of an infected person.
    - Direct contact with objects (clothes, bedding, needles, and medical equipment) contaminated with body fluids of an infected person. Ebola virus can survive on dry surfaces for several hours and in body fluids up to several days.
    - Contact with infected corpses
    - Nosocomial transmission – exposed to contaminated needles, syringes, and materials
    - Sexual transmission by survivors of EVD – virus is known to survive in semen at least 6-12 months following infection
- The most concerning epidemiologic risk factors to identify are
    1) Recent travel to an area where EVD is endemic or an outbreak is occurring
    2) Recent contact with someone, alive or corpse, who has suspected or confirmed EVD. Those at highest risk include health workers while caring for patient EVD and family and friends in

close contact (within 3 feet of infected patient) without appropriate Personal Protective Equipment (PPE).

Clinical features

Signs and symptoms:

The natural course of EVD tends to follow a predictive pattern of symptoms.

- **Days 0-3:** The initial symptoms are usually **nonspecific** and confused with more common illnesses like **malaria, typhoid fever, and influenza**. Such signs and symptoms include fever, fatigue, muscle weakness and pain, loss of appetite, sore throat, and headaches.
- **Days 3-10:** Patient may begin to develop **gastrointestinal and "wet" symptoms** including lower chest or epigastric pain, cramps or diffuse abdominal pain (also can be isolated to right upper quadrant), nausea and vomiting, and diarrhea. A diffuse maculopapular rash may also develop by day 5-7.
- **Days 7-12:** Patient will develop **severe complications:**
    - **Evidence of severe dehydration or hypovolemia** (low blood volume): oliguria or low urine output, dry mucous membranes, tachycardia (rapid heartbeat), tachypnea (rapid breathing), diminished mental status
    - **Neurological involvement**: confusion, unable to keep attention, agitation, extreme weakness. **Death** often follows these neurologic complications within 24-48 hours.
    - **Hemorrhagic manifestations**: petechiae (tiny colored dots below the skin), or bleeding from: vomit (hematemesis), stool (hematochezia), gums, conjunctivae (eyes), nose, IV and puncture sites.
    - **Multi-organ failure**
- **Not all patients follow this pattern of illness. Be wary of any patient with epidemiologic risk factors associated with EVD who develops any of the clinical features described.**
- Some clinical features are classically associated with a high probability of EVD. However, studies are inconsistent in understanding how predictive these features are in diagnosing EVD.
    - Confusion
    - Conjunctivitis
    - Intense fatigue
    - Hiccups
    - Diarrhea

Laboratory testing:

Diagnostic tests for Ebola virus infection are principally based upon the detection of specific RNA sequences by RT-PCR in blood or other body fluids. Viral antigens can also be detected using immunoassays. No single routine laboratory result is diagnostic of EVD. However, EVD is associated with several different laboratory test abnormalities. The most common abnormalities seen are:

Laboratory test	Component of test	Seen with EVD
CBC	Hemoglobin/hematocrit (Hb/Hct)	Hematocrit may be decreased, normal, or increased
	Platelets (Plt)	Thrombocytopenia - Platelet counts decrease during the acute phase of illness, but generally do not fall below 50,000 to 100,000/microL.
	White Blood cell count (WBC)	Leukopenia – usually presenting as lymphopenia, followed by an elevated neutrophil count.
Basic metabolic panel or chemistry	Creatinine (Cr) - marker for kidney injury or failure	Can be normal or elevated in EVD. Elevated Cr, a sign of kidney damage, is associated with poorer prognosis
	Potassium (K)	Can be low, normal, or elevated in EVD. Elevated K is associated with poorer prognosis.
	Sodium (Na)	Can be low (hyponatremia) or normal in EVD.
	Urea nitrogen	Often elevated in EVD.
Other	AST and ALT (liver enzymes)	Usually elevated.
	Prothrombin time (PT) and partial thromboplastin time (PTT)	Can be normal or elevated (indicative or poor clotting function). Elevated PT and PTT are associated with poorer prognosis.
Urinalysis	Protein	Proteinuria is common in EVD.

Differential Diagnosis:

Any patient with possible EVD should be evaluated for alternative diagnoses. At the clinician's discretion the following diagnoses should be considered if epidemiologic and clinical features warrant diagnostic evaluation (in particular, clinicians should strongly consider influenza testing, rapid malaria testing, and blood cultures):

- Influenza
- Malaria
- Typhoid fever
- Other viral hemorrhagic fevers – Lassa, Marburg, dengue
- Meningococcal disease
- Measles
- Traveler's diarrhea

Diagnostics:

- RT-PCR
    - RNA in blood – peaks around day 3-7 of symptoms; in survivors, falls to undetectable levels between day 2-3 weeks after symptom onset. A negative test done prior to 72 hours after symptom onset does not rule out EVD.
    - RNA can also be detected in various other body fluids from a number of days to several months after illness onset – saliva, tears, sweat, breastmilk, urine, cerebrospinal fluid, ocular fluid, amniotic fluid, vaginal fluid, semen.
- Serology
    - Antibodies in blood (IgM and IgG) – detectable around day 5 of symptoms, IgM becomes undetectable around 2 months following symptom onset.

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